PATENT ABSTRACTS OF JAPAN

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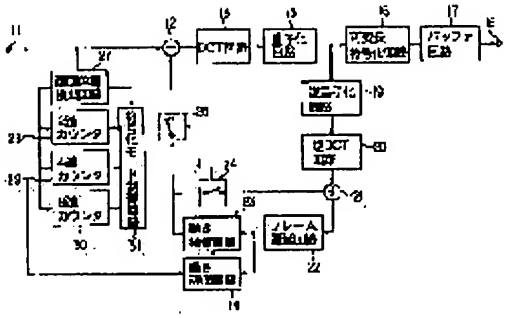
(54) PICTURE COMPRESSION-ENCODING DEVICE

(57)Abstract:

PURPOSE: To shorten refreshing cycle, to improve resistance to transmission errors and to evade the degradation of the entire encoding efficiency by shortening screen set-up time at the time of scene conversion when a power source is applied on a decoder side.



CONSTITUTION: Picture signals from an input terminal 11 are supplied to a screen position detection circuit 27 and to what area of a screen respective blocks to be supplied to a DCT circuit 13 for which an encoding processing is to be performed are equivalent within one frame is detected. In this case, the screen is divided into a center part A, a middle part B and a peripheral part C, a binary counter 28 is counted up when it is judged that the block for which the encoding processing is to be performed is included in the center part A, a quaternary counter 29 is counted up when it is judged that it is included in the middle part B and an octanary counter 30 is counted up when it is judged that it is included in the peripheral part C respectively. In an encoding mode control circuit 31, based on the detected result of the circuit 27 and the count values of the counters 28 to 30, switches 24 and 25 are turned ON or OFF.

LEGAL STATUS

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[Date of final disposal for application]

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CLAIMS

[Claim(s)]
[Claim 1] In the picture compression coding equipment which performs alternatively the 2nd mode in which interframe coding processing is performed using information the 1st mode in which coding processing in a frame is performed to a picture signal using the information in a frame, and inter-frame difference -- Picture compression coding equipment characterized by dividing said frame into two or more fields, and performing said the 1st mode and 2nd mode repeatedly a mutually different period for each [which was divided] of this field of every.
[Claim 2] Said frame is picture compression coding equipment according to claim 1 characterized by coming it shorter than the period from which said 1st mode is performed in a circumference part to carry out the period from which it is divided into a central part and a circumference part, and said 1st mode is performed in a central part.
[Claim 3] Picture compression coding equipment according to claim 1 or 2 characterized by said 1st mode not being performed by coincidence and coming to make in each field which divided said frame.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to amelioration of the picture compression coding equipment which performs band compression digital coding which combined the coding processing in a frame, and interframe coding processing to the digitized picture signal.
[0002]
[Description of the Prior Art] In digitizing and transmitting a picture signal or recording it on a record medium as everyone knows, in order to lessen amount of information, more various band compression methods than before can be considered. For example, as animation compression specification for are recording media, although MPEG (Moving Picture Experts Group) is defined, in order to use the combination of inter-frame predicting coding and a motion compensation in order to make the redundancy of the direction of a time-axis low, and to make the redundancy of space shaft orientations low, DCT (discrete cosine transform) processing is used according to this.
[0003] Drawing 4 shows the conventional picture compression coding equipment for realizing the band compression method by such MPEG specification. That is, a sign 11 is an input terminal with which the digitized picture signal is supplied. The picture signal supplied to this input terminal 11 is supplied to the motion weighting network 14 while it is supplied to the DCT circuit 13 through a subtractor circuit 12. Among these, the DCT circuit 13 incorporates 64 pixels which becomes about the picture signal outputted from a subtractor circuit 12 at 8 pixels of 8 pixel x perpendicular directions of horizontal directions as 1 block, changes a pixel array into a frequency domain from a time-axis field per block, and is outputting the transform coefficient to the quantization circuit 15.
[0004] And this quantization circuit 15 carries out quantization processing of the inputted transform coefficient, and it turns the multiplier value after quantization processing to a high frequency field from a low frequency field for every block, it carries out a zigzag scan one by one, and it is outputted to the variable-length coding network 16 so that it may fall within a range with the fixed amount of signs according to the coding mode mentioned later. This variable-length coding network 16 is carrying out variable-length-coding processing of the number of a zero multiplier and the value of a non-zero multiplier to precede collectively. Then, since the data outputted from the variable-length coding network 16 are an adjustable rate, they are supplied to the buffer circuit 17 for sign are recording, are changed into the data of a fixed rate, and are taken out from an output terminal 18.
[0005] Moreover, after the reverse quantization circuit 19 is supplied and reverse-quantizing, the output of the above-mentioned quantization circuit 15 is supplied to the reverse DCT circuit 20, and is reproduced by the picture signal of the original time-axis field. After the playback picture signal outputted from this reverse DCT circuit 20 is supplied to the frame delay circuit 22 through an adder circuit 21 and is delayed one frame, it is supplied to the motion compensation circuit 23 and the above-mentioned motion weighting network 14, respectively. Among these, it moves based on the playback picture signal before [one] being outputted from the picture signal inputted into the input terminal 11, and the frame delay circuit 22, and the motion weighting network 14 detects an amount, and is

outputting the detected amount of motions to the motion compensation circuit 23 as an amount of motion vectors.

[0006] This motion compensation circuit 23 is outputting the picture signal which carried out the motion compensation based on the amount of motion vectors outputted from the motion weighting network 14 to the playback picture signal before [one] being outputted from the frame delay circuit 22. And the picture signal outputted from this motion compensation circuit 23 is supplied to the above-mentioned adder circuit 21 and a subtractor circuit 12, respectively, when switches 24 and 25 are ON states. Based on the change-over signal supplied to an input terminal 26 according to coding mode, change-over control is carried out at an OFF state at both the times of the coding mode in a frame, and change-over control of these switches 24 and 25 is carried out at an ON state at both the times of inter-frame predicting-coding mode.

[0007] Here, actuation of the picture compression coding equipment mentioned above is explained. There are coding mode in a frame and inter-frame predicting-coding mode as coding mode of a picture signal. The coding mode in a frame is coding processing only using the picture signal supplied to the input terminal 11, and inter-frame predicting-coding mode carries out coding processing of the difference of the picture signal supplied to the input terminal 11, and a former playback picture signal.

[0008] First, the coding processing in a frame is explained. Both the switches 24 and 25 are controlled by the OFF state at the time of this coding processing in a frame. And after being changed into a frequency domain from a time-axis field in the DCT circuit 13 and carrying out quantization processing in the quantization circuit 14, variable-length-coding processing is carried out by the variable-length coding network 16, and the picture signal supplied to the input terminal 11 is changed into the data of a fixed rate in a buffer circuit 17, and is taken out from an output terminal 18.

[0009] After the output of the quantization circuit 15 is returned to the signal of the original time-axis field in the reverse quantization circuit 19 and the reverse DCT circuit 20 and being delayed in the frame delay circuit 22, in addition, by moving with the motion compensation circuit 23 and supplying a weighting network 14, respectively Although the picture signal by which the motion compensation was carried out is outputted from the motion compensation circuit 23, since both the switches 24 and 25 are OFF states, the picture signal by which the motion compensation was carried out will not be used, but variable length coding of the picture signal supplied to the input terminal 11 will be carried out as it is after all.

[0010] On the other hand, both the switches 24 and 25 are controlled by the ON state at the time of inter-frame predicting-coding processing. For this reason, difference with the picture signal with which the playback picture signal before [which is outputted from the motion compensation circuit 23 / one] the motion compensation was carried out was supplied to the subtractor circuit 12, and was supplied to the input terminal 11 is computed. And after the differential signal outputted from this subtractor circuit 12 is changed into a frequency domain from a time-axis field in the DCT circuit 13, quantization processing of it is carried out in the quantization circuit 14.

[0011] Moreover, by returning the output of the quantization circuit 15 to the differential signal of the original time-axis field in the reverse quantization circuit 19 and the reverse DCT circuit 20, and adding it with the playback picture signal before [which is outputted by the adder circuit 21 from the motion compensation circuit 23 / one] the motion compensation was carried out, the picture signal supplied to the input terminal 11 is generated, the frame delay circuit 22 is supplied, and the motion compensation processing by the motion compensation circuit 23 is presented hereafter. Thus, in inter-frame predicting-coding processing, since coding processing of the differential signal of the playback picture signal before [which is outputted from the motion compensation circuit 23 / one] the motion compensation was carried out, and the picture signal supplied to the input terminal 11 is carried out, when inter-frame correlation is strong, compared with coding in a frame, coding effectiveness can be raised like a dynamic image.

[0012] Next, the screen type in the above-mentioned MPEG specification is explained. That is, in MPEG, as shown in drawing 5 , the dynamic image of a multiple frame is collectively called GOP (Group of Picture). The screen in GOP has three kinds of types shown below, and contains I picture of at

least one or more sheets.
(1) I picture : the coding screen in a frame.
(2) P picture : inter-frame predicting-coding screen.
(3) B picture : bidirectional predicting-coding screen.
[0013] Although one screen is divided into the block called a macro block and coding processing is performed in MPEG, all macro blocks are performing coding processing in a frame in I picture. Although P picture is an inter-frame predicting-coding screen, it can choose the coding processing in a frame, and inter-frame predicting-coding processing for every macro block. Moreover, B picture can also choose the hard flow inter-frame predicting-coding processing using the forward direction inter-frame predicting-coding processing using the coding processing in a frame, and the past playback image to prediction, and the playback image of the future to prediction, and the interpolation-[prediction] inter-frame predicting-coding processing using the playback image of both the past / future for every macro block.
[0014] Like the example of the list of the screen type shown in drawing 5 , one periodic assembly of I, P, and B picture is GOP. Here, cautions being need is that the sequence of a subject-copy side differs from the order of processing of a screen. Drawing 6 shows the list of the screen on processing and media. First, in coding processing, after processing I and P picture previously, B picture inserted in between is processed. Moreover, I picture must be first encoded by GOP. Next, although B picture decrypts and is immediately displayed in decryption processing, after I and P picture decrypt, and they display B picture, they are displayed.
[0015] However, with the above conventional picture compression coding equipment, when the encoded picture signal is transmitted or it records on a record medium, the following problems will arise in the regenerative-apparatus side which reproduces the receiver which receives the transmitted picture signal, and a record medium. When a picture signal is transmitted along the screen type shown, for example in drawing 5 or it records on a record medium, namely, in a receiver or a regenerative apparatus First, in order to have to decrypt I picture, by the time an image is displayed at the time of conversion of the scene by switching the case where the power source of a receiver or a regenerative apparatus is switched on, and a channel etc., the delay for a period of GOP will occur at the maximum, and the setup of a screen will take time amount.
[0016] Moreover, in the broadcast which is a kind of transmission of a picture signal, although it has called it refresh to perform coding in a frame equivalent to I picture, since coding in a frame has many amounts of signs, when the period of refresh is short, the whole coding effectiveness will deteriorate. On the other hand, in order to spread the error to future picture signals until the following I picture is encoded when a transmission error occurs in P picture or B picture, when a long refresh period is taken, un-arranging [that the resistance over a transmission error falls] will arise.
[0017]
[Problem(s) to be Solved by the Invention] As mentioned above, in conventional picture compression coding equipment, it is a decode side, and since it is necessary to decrypt I picture first, it has the problem that the setup of a screen takes time amount at the case where the power source of a receiver or a regenerative apparatus is switched on, the time of conversion of a scene, etc. Moreover, if a refresh period is short, the whole coding effectiveness will deteriorate, and if long, it also has un-arranging [that the resistance over a transmission error falls].
[0018] Then, this invention shortens a refresh period and aims at offering the very good picture compression coding equipment which does not degrade the whole coding effectiveness even if it raises the resistance over a transmission error while it was made in consideration of the above-mentioned situation and can shorten the setup time of a screen at the power up by the side of decode equipment, the time of conversion of a scene, etc.
[0019]
[Means for Solving the Problem] the 1st mode in which the picture compression coding equipment concerning this invention performs coding processing in a frame to a picture signal using the information in a frame, and inter-frame difference -- it is aimed at what performs alternatively the 2nd

mode in which interframe coding processing is performed using information. And a frame is divided into two or more fields, and it is made to perform the 1st mode and 2nd mode a mutually different period repeatedly for each [which was divided] of this field of every.
[0020]
[Function] Since it was made to perform the 1st mode in which coding processing in a frame is performed, and the 2nd mode in which interframe coding processing is performed, a mutually different period repeatedly for every field of the divided frame according to the above configurations At the time of conversion of the scene by switching the case where the power source of a receiver or a regenerative apparatus is switched on, and a channel etc., the setup time of an apparent screen can be shortened compared with the case where the whole screen is refreshed the same period like before. Moreover, since the period with which the 1st mode is performed to other fields is lengthened even if it shortens the period with which the 1st mode is performed to a certain field and raises the resistance over a transmission error, the whole coding effectiveness does not deteriorate.
[0021]
[Example] Hereafter, one example of this invention is explained to a detail with reference to a drawing. In drawing 1 , the same sign is attached and shown in the same part as drawing 4 . That is, the picture signal supplied to the input terminal 11 is supplied to the screen location detector 27. This screen location detector 27 has detected whether each block with which the DCT circuit 13 is supplied and coding processing is performed in one frame is equivalent to which field of a screen.
[0022] Here, the screen is divided into three fields of a center section A, pars intermedia B, and Periphery C as shown in drawing 2 . And the screen location detector 27 makes a binary counter 28 count up, when it is judged that each block with which the DCT circuit 13 is supplied and coding processing is performed in one frame is included in the center section A. Moreover, the screen location detector 27 makes 4 ** counter 29 count up, when it is judged that each block with which the DCT circuit 13 is supplied and coding processing is performed in one frame is included in pars intermedia B. Furthermore, the screen location detector 27 makes the octal counter 30 count up, when it is judged that each block with which the DCT circuit 13 is supplied and coding processing is performed in one frame is included in Periphery C.
[0023] and binary [these], 4 **, and the octal counters 28, 29, and 30 -- respectively -- circulation -- counting -- it operates and each of those output counted value is supplied to the coding mode control circuit 31. Based on the detection result of the screen location detector 27, and the counted value of binary, 4 **, and the octal counters 28, 29, and 30, this coding mode control circuit 31 switched switches 24 and 25 to the ON state or the OFF state, and is controlling them.
[0024] In this case, as shown in drawing 3 , switches 24 and 25 switch both the center sections A of the screen to an OFF state with the period of two frames by the binary counter 28, they are controlled, and coding processing in a frame is carried out. Moreover, switches 24 and 25 switch both the pars intermedia B of a screen to an OFF state with the period of four frames with 4 ** counter 29, it is controlled, and coding processing in a frame is carried out. Furthermore, switches 24 and 25 switch both the peripheries C of a screen to an OFF state with the period of eight frames with the octal counter 30, they are controlled, and coding processing in a frame is carried out.
[0025] For example, when encoding the pars intermedia B of Screen 1 shown in drawing 3 , by detecting that the field encoded by the screen location detector 27 is pars intermedia B, 4 ** counter 29 counts up and it judges that the coding mode control circuit 31 performs inter-frame predicting-coding processing based on the detection result of the screen location detector 27, and the output counted value of 4 ** counter 29, and both the switches 24 and 25 are switched to an ON state, and are controlled.
[0026] Moreover, when encoding the center section A of Screen 5 shown in drawing 3 , by detecting that the field encoded by the screen location detector 27 is a center section A, a binary counter 28 counts up and it judges that the coding mode control circuit 31 performs coding processing in a frame based on the detection result of the screen location detector 27, and the output counted value of a binary counter 28, and both the switches 24 and 25 are switched to an OFF state, and control.
[0027] Thus, the mode is changed for every field and one screen is encoded. In this case, as mentioned

above, when an I region and the field which carried out inter-frame predicting coding are made into P field and the field which carried out bidirectional predicting coding is made into area B for the field encoded in the frame, a refresh period has the shortest center section A of the screen, and it is I region - P field.... It becomes a period. Moreover, the pars intermedia B of a screen is P field area B area B - an I region.... It becomes a period. Furthermore, the periphery C of a screen is area B area B I region area B area B - P field area B - P field.... It becomes the becoming period.

[0028] That is, according to the above-mentioned example, the refresh period of the center section A of the screen is shortened, and it is made to lengthen the refresh period of the periphery C of a screen. Here, considering being easy to gaze at the central part of a screen, a part for a screen center section having many information components as a property of a picture signal and a viewer can shorten the setup time of an apparent screen compared with the case where the whole screen is refreshed the same period like before, at the time of conversion of the scene by switching the case where the power source of a receiver or a regenerative apparatus is switched on, and a channel etc.

[0029] Moreover, even if it shortens the refresh period to a part for a screen center section and raises the resistance over a transmission error, since the refresh period of a screen circumference part is lengthened, the whole coding effectiveness does not deteriorate. Furthermore, if it is made for the timing encoded in a frame in each field not to lap with a screen, compared with the case where the whole screen is encoded in a frame, the capacity of a buffer circuit 17 is reducible. In addition, this invention is not limited to the above-mentioned example, in the range which does not deviate from that summary this outside, can deform variously and can be carried out.

[0030]

[Effect of the Invention] As explained in full detail above, while being able to shorten the setup time of a screen at the power up by the side of decode equipment, the time of conversion of a scene, etc. according to this invention, the very good picture compression coding equipment which does not degrade the whole coding effectiveness even if it shortens a refresh period and raises the resistance over a transmission error can be offered.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The block block diagram showing one example of the picture compression coding equipment concerning this invention.
[Drawing 2] Drawing shown in order to explain division of the screen in this example.
[Drawing 3] Drawing shown in order to explain change of the refresh period in this example.
[Drawing 4] The block block diagram showing conventional picture compression coding equipment.
[Drawing 5] Drawing shown in order to explain GOP in ****** equipment.
[Drawing 6] Drawing shown in order to explain the coding decryption processing in this GOP, and change of the list of the screen on media.
[Description of Notations]
11 [-- Motion weighting network,] -- An input terminal, 12 -- A subtractor circuit, 13 -- A DCT circuit, 14 15 -- A quantization circuit, 16 -- A variable-length coding network, 17 -- Buffer circuit, 18 [-- Adder circuit,] -- An output terminal, 19 -- A reverse quantization circuit, 20 -- A reverse DCT circuit, 21 22 [-- An input terminal, 27 / -- A screen location detector, 28 / -- A binary counter, 29 / -- 4 ** counter, 30 / -- An octal counter, 31 / -- Coding mode control circuit.] -- A frame delay circuit, 23 -- 24 A motion compensation circuit, 25 -- A switch, 26

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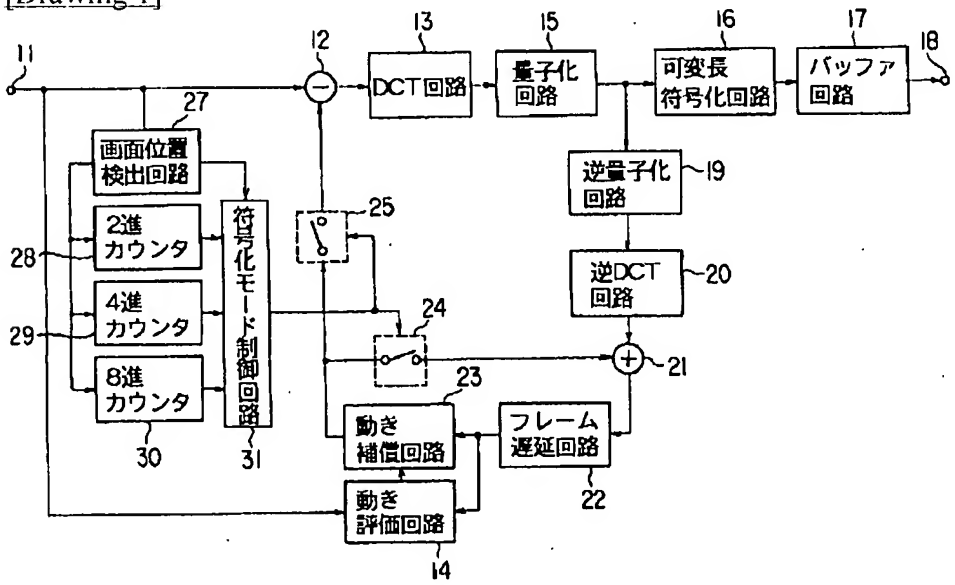
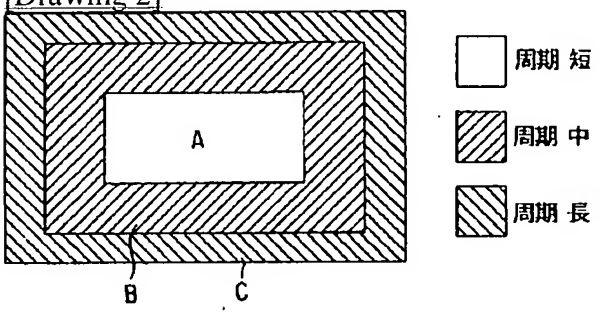
DRAWINGS

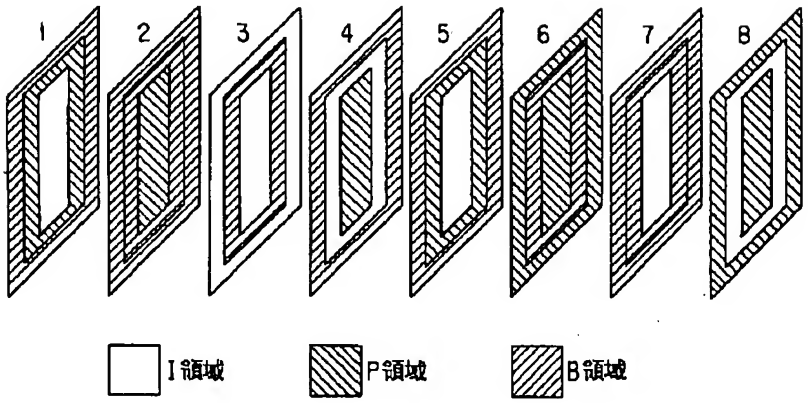
[Drawing 1]



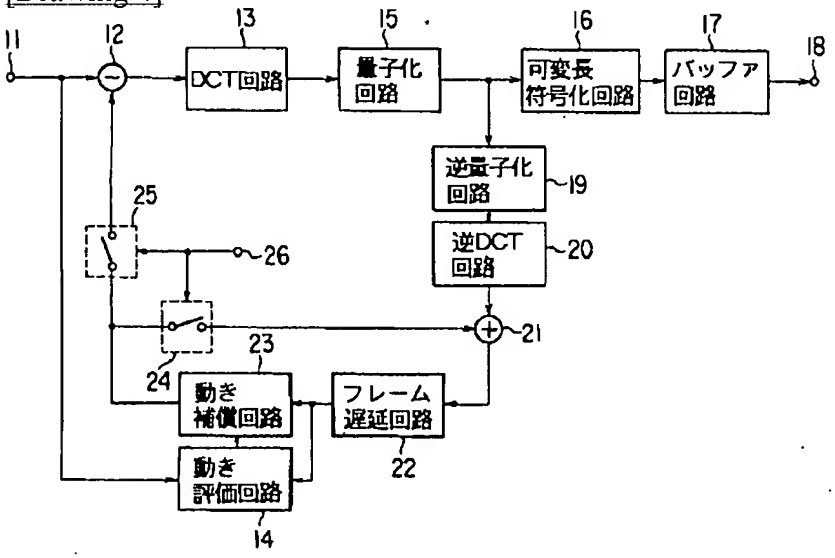
[Drawing 2]



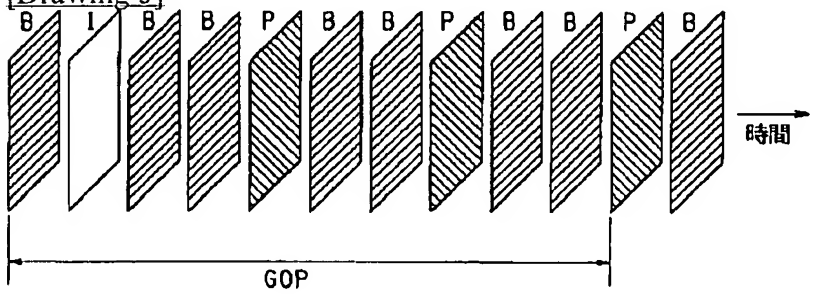
[Drawing 3]



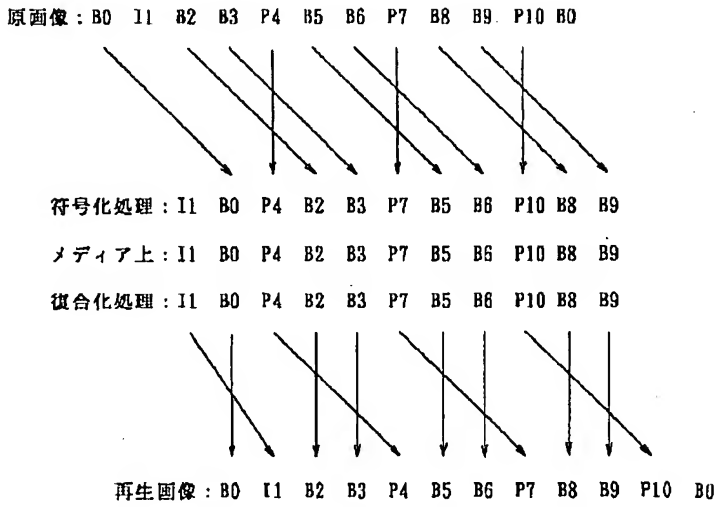
[Drawing 4]



[Drawing 5]



[Drawing 6]



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